



Kingdom of the Netherlands



WATER-ENERGY-FOOD NEXUS

IN THE UNITED ARAB EMIRATES

ABU DHABI POWER &
UTILITIES SECTOR



WATER



ENERGY



FOOD

WATER-ENERGY-FOOD NEXUS IN THE UAE



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UAE COUNTRY OVERVIEW

ENVIRONMENTAL ISSUES:	Air pollution; rapid population growth and high energy demand contribute to water scarcity; lack of natural freshwater resources compensated by desalination plants; land degradation and desertification; waste generation, beach pollution from oil spills
NATURAL RESOURCES:	petroleum, natural gas
POPULATION:	9,701,315 (88% expat) – 2018 est. 2.785 million Dubai, 1.571 million Sharjah, 1.42 million Abu Dhabi (capital)
URBANIZATION:	86.5%
GDP (PPP):	696 billion – 2017 est. agriculture: 0.9%; industry: 49.8%; services: 49.2%
GDP – PER CAPITA (PPP):	\$68,600 – 2017 est.
INDUSTRIES:	petroleum and petrochemicals; fishing, aluminum, cement, fertilizer, commercial ship repair, construction materials, handicrafts, textiles

United Arab Emirates



LAND AREA:	83,600 km ²
CLIMATE:	Desert; cooler in eastern mountains
TERRAIN:	Flat, barren coastal plain merging into rolling sand dunes of vast desert; mountains in east

RELEVANT NATIONAL STRATEGIES	OVERVIEW	ASSOCIATED TARGETS
Water Security Strategy 2036	Unveiled in 2017 by the Ministry of Energy and Industry, the strategy focuses on detailed goals and forecasts for the following three programs: demand side management, water supply management and emergency production and distribution.	<ul style="list-style-type: none"> 21% reduction in water demand compared to 2017 Increase treated wastewater reuse to 95% Increase national storage capacity by 2 days
Energy Strategy 2050	Unveiled in 2017 by the Ministry of Energy & Industry, the Strategy documents the nation's effort to diversify its energy sources with focus on renewable energy and energy efficiency – through an investment of AED 600 billion (USD 163 billion).	<ul style="list-style-type: none"> Increase clean energy use by 50% Cutting CO2 emissions by 70% Improving energy efficiency by 40% Targeted energy mix of 44% clean energy; 6% nuclear; 38% natural gas and 12% clean coal

ABU DHABI POWER & UTILITIES SECTOR OVERVIEW

While Abu Dhabi Emirate's Power and Water sector is largely unbundled, it remains centrally controlled and government owned, via the Department of Energy (DoE), which is the regulatory/licensing authority and the parent company of the power and water entities in Abu Dhabi.

The DoE owns majority shares in 10 power and water plants in the UAE through an Independent Power and/or Water Producer (IPP/IWPP) model. The majority of power and water production in Abu Dhabi is coupled through cogeneration facilities that operate under various technology configurations. Natural gas is the primary fuel source for both power generation and water desalination (supplied through Dolphin Energy and ADNOC), with diesel used primarily for backup generators. Thermal based desalination (i.e. MSF and MED) have historically been the predominant form of desalination in Abu Dhabi, utilizing waste steam from power generation units. However, thanks to improved membrane technology, reduced costs, and a push toward power and water decoupling, reverse osmosis (RO) has seen a rise in Abu Dhabi and the wider region.

In Abu Dhabi and the Northern Emirates, the sole purchaser and seller of water and electricity is the Emirates Water & Electricity Company (EWEC), which secures fuel for the IPP/IWPPs through

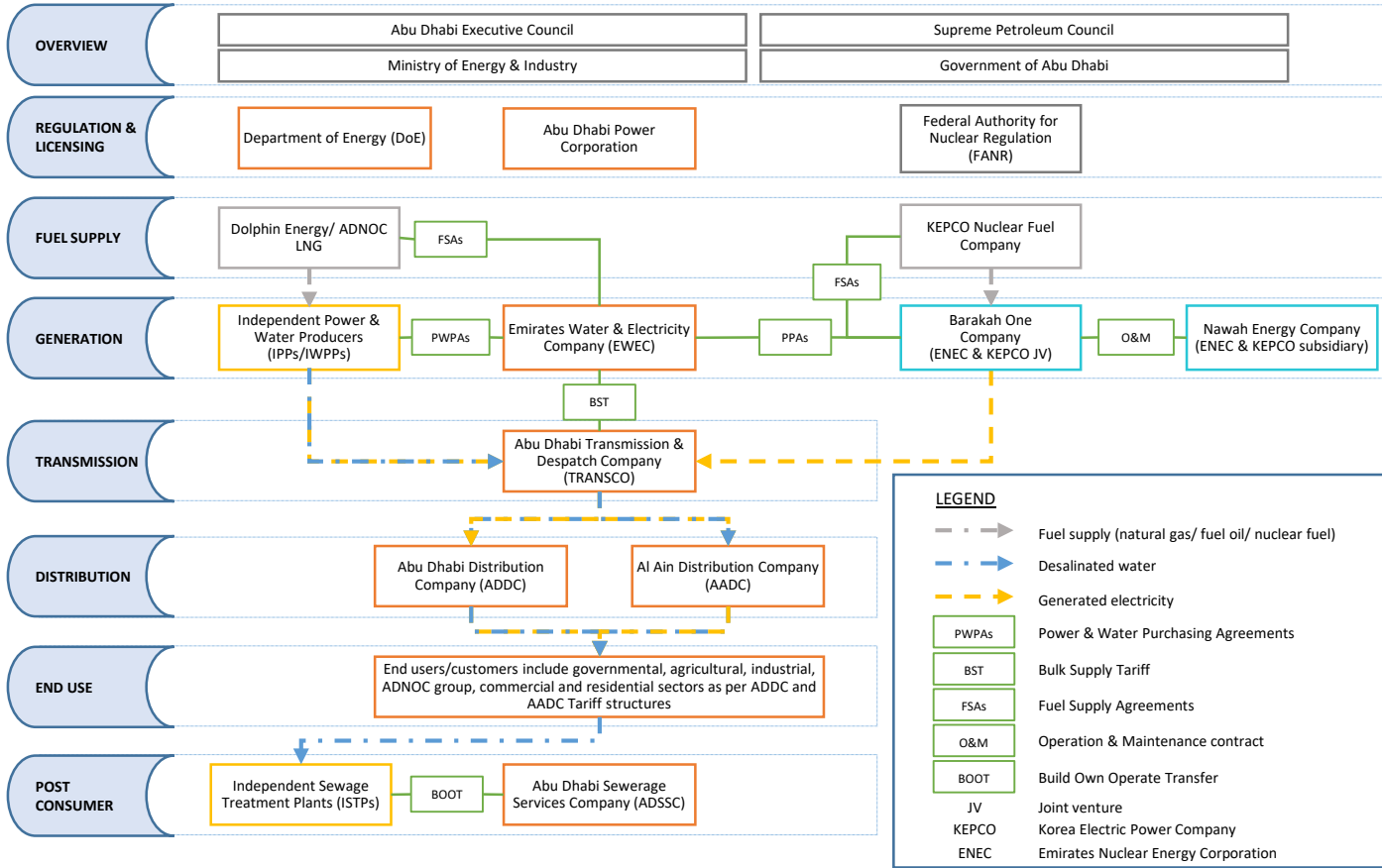
Fuel Supply Agreements (FSAs) and sells the water and electricity to the Abu Dhabi Transmission and Despatch Company (TRANSCO), through a Bulk Supply Tariff (BST).

TRANSCO, which is responsible for the entire Abu Dhabi Emirate and connections to the national grid, receives power and water from the IPPs/IWPPs (and in the future from the Barakah nuclear power plant), then transmits them to the distribution companies (DESCOs). The two DESCOs in Abu Dhabi Emirate include Abu Dhabi Distribution Company (ADDC) and Al Ain Distribution Company (AADC), which cover Abu Dhabi Municipality and Al Ain Municipality respectively. Various end users receive their water and electricity from ADDC and AADC as per their respective tariff rates (available online). Power and water subsidies exist within Abu Dhabi, mainly at the distribution level, while the BST is a closer representation of the actual production cost.

While tariffs have increased and been restructured in previous years, they remain largely static for most customers. It is generally expected that the DESCOs will continue the trend of tariff rate increases/subsidy removal and will likely introduce new tariff structures in the future to promote better demand side management, be they block rate or time of use tariffs.

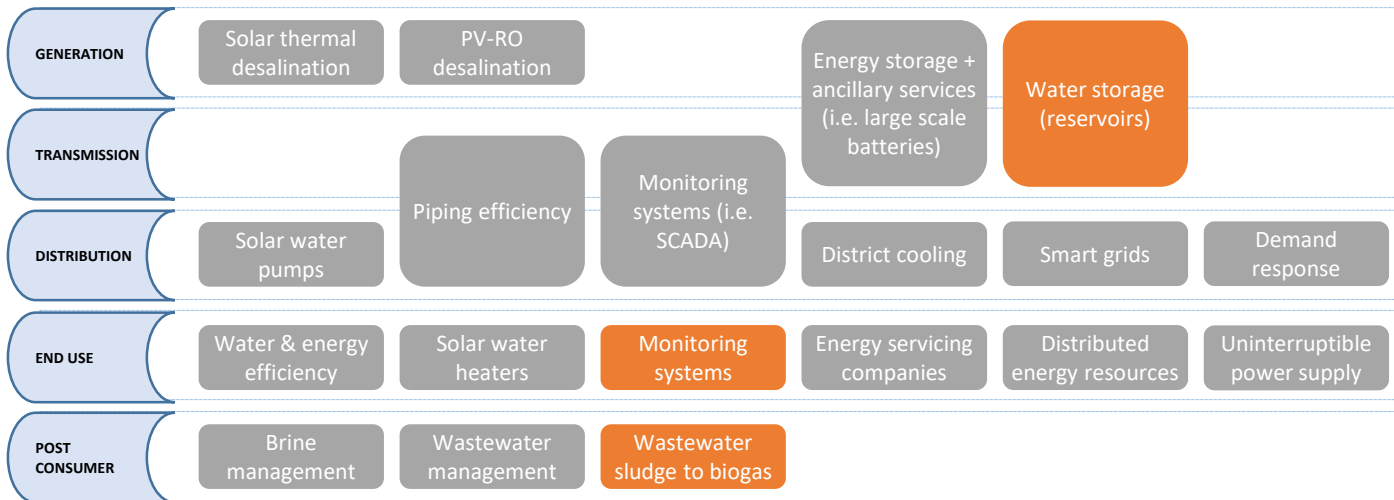
ABU DHABI POWER & UTILITIES SECTOR OVERVIEW

Power & Water Sector Entity Map



Power & Water Sector Opportunities

The opportunities presented below are not by no means exhaustive. They are identified in alignment with the ambitions of the relevant national strategies and the needs of the various power and utility ecosystem across the value chain. It is worth highlighting the scale of opportunities available downstream in the value chain. With the focus the past few years being on operational efficiency and cost cutting, demand side management has never been as relevant, particularly as subsidies have been reduced and tariffs increased.



Examples of Dutch services

Water storage	Monitoring systems	Wastewater sludge to Biogas
<ul style="list-style-type: none"> Water reservoir design and/or EPC work Operation & maintenance work 	<ul style="list-style-type: none"> Software (SCADA and/or BMS/BAS) Physical sensor and meter supply System integration 	<ul style="list-style-type: none"> Feasibility studies Design and/or EPC work of biogas facility Operation & maintenance work

ABU DHABI POWER & UTILITIES

SECTOR OVERVIEW

Power & Water Sector Entity Profiles

Entity	Ownership	Entity Overview
Department of Energy (DoE)	Abu Dhabi Government	The DoE was established in 2018, following the merger of the Regulatory Supervision Bureau (RSB) and Abu Dhabi Water & Electricity Authority (ADWEA). The DoE is responsible for the planning and direction of Abu Dhabi's energy sector ¹ . Their role includes the formulation and implementation of public policies that drive the future direction and provisioning of the energy* sector in all its forms.
Abu Dhabi Power Corporation	DoE Subsidiary	Abu Dhabi Power is an entity with a mandate to oversee the performance and guide the development of the energy sector in Abu Dhabi and the Northern Emirates by overseeing the financial and operational performance of its Operating and Holding Companies (OpCos, HoldCos) of Utility Assets, from the generation of power and water, through transmission and distribution to the end-user).
Emirates Water & Electricity Company (EWEC)	DoE Subsidiary	Formerly the Abu Dhabi Water & Electricity Company (ADWEC), EWEC is the 2018 consolidation of ADWEC and the Federal Electricity & Water Authority (FEWA), which was the utility responsible for the Northern Emirates. The key role of EWEC is to act as a guarantor of the security of supply of electricity and water to consumers in the Emirate of Abu Dhabi and the Northern Emirates. This role is fulfilled through: Careful short-term and long-term balancing of supply and demand (Demand Forecast and Generation Expansion Planning); long-term Power and Water Purchase Agreements (PWPAs) with the Power & Water Producers, Bulk Supply Tariff (BST) sales agreements with the Distribution Companies (ADDC and AADC) and Fuel Supply Agreements (FSA) with Fuel Suppliers.
Abu Dhabi Transmission & Despatch Company (TRANSCO)	DoE Subsidiary	TRANSCO is responsible for developing, operating and maintaining the high voltage power transmission and bulk water transmission networks within the Emirate of Abu Dhabi. TRANSCO transfers water and electricity to ADDC and AADC. TRANSCO is also responsible for exporting electricity to the UAE national grid along with the Gulf Cooperation Council Interconnection Authority.
Abu Dhabi Distribution Company (ADDC)	DoE Subsidiary	ADDC is responsible for the distribution of water and electricity within the Abu Dhabi municipality. ADDC receives water and electricity from TRANSCO, which handles transmission.
Al Ain Distribution Company (AADC)	DoE Subsidiary	AADC is responsible for the distribution of water and electricity within the Al Ain municipality. AADC receives water and electricity from TRANSCO, which handles transmission.
Dolphin Energy Limited	Mubadala (51%), Total (24.5%), Occidental Petroleum (25.5%)	Dolphin Energy Limited was established in 1999 by the Abu Dhabi government to implement the Dolphin Gas Project. The Project involves the processing and compression of offshore gas at Ras Laffan Industrial City in Qatar and its export via subsea pipeline to Taweelah in Abu Dhabi, and from there to other parts of the UAE and Oman. The project delivers around 2 billion standard cubic feet of natural gas daily, constituting the primary source of fuel for the UAE's and Oman's power generation and desalination.
ADNOC LNG	ADNOC (70%), Mitsui & Co (15%), BP (10%), Total (5%)	Amongst their other operations and responsibilities, ADNOC LNG also supplies one billion standard cubic feet of gas per day for residential and industrial use to the UAE national grid through IPPs and IWPPs.
Independent Power & Water Producers (IPPs/IWPPs)	DoE and various companies (DoE always 60% ownership)	With the exception of Al Mirfa Power Company (the only power plant wholly owned by DoE), Abu Dhabi's other power plants follow a public private partnership (PPP) approach, with 60% ownership by DoE and 40% coming from private sector companies. This approach is referred to as Independent Power Plant (IPP) and Independent Water & Power Plant (IWPP). IPPs and IWPPs form PPAs/PWPAs with ADWEC. Water and electricity generated from the plants enters thereafter the TRANSCO network.
Abu Dhabi Sewerage Services Company (ADSSC)	Abu Dhabi Government	ADSSC is responsible for the collection, treatment and disposal of wastewater discharged from residential, commercial and industrial buildings in the Emirate of Abu Dhabi, and the distribution of recycled water for irrigation purposes in gardens, parks, farms and green spaces. Biosolids are also available for reuse.
Independent Sewage Treatment Plants (ISTPs)	Abu Dhabi Government	ADSSC is responsible for the collection, treatment and disposal of wastewater discharged from residential, commercial and industrial buildings in the Emirate of Abu Dhabi, and the distribution of recycled water for irrigation purposes in gardens, parks, farms and green spaces. Biosolids are also available for reuse.
Federal Authority for Nuclear Regulation (FANR)	Abu Dhabi Government	Established in September 2009, FANR is the responsible regulatory body for the nuclear sector in the UAE in accordance with Federal Law by Decree No 6 of 2009.
Emirates Nuclear Energy Corporation (ENEC)	Abu Dhabi Government	ENEC is responsible for the design, construction and ownership of the UAE's first nuclear energy plant (Barakah). ENEC is regulated by the FANR.
Barakah One Company	ENEC (82%) and KEPCO (18%)	Barakah One Company is an independent joint venture subsidiary of ENEC and KEPCO formed in 2016 to represent the commercial and financial interests of the Barakah project. The DoE issues Barakah One Company its generation license, while the FANR issues its license to operate. Barakah One Company sells electricity to ADWEC through a PPA, with TRANSCO being the electricity off-taker.
Nawah Energy Company	ENEC and KEPCO joint venture	Nawah Energy Company is an independent joint venture subsidiary of ENEC and KEPCO formed in 2016, to operate and maintain Units 1 to 4 at the Barakah Nuclear Power Plant.
Nuclear Fuel suppliers	Various companies	The enriched uranium will be supplied to KEPCO Nuclear Fuels (KNF), which will manufacture the fuel assemblies for use in the four planned UAE units. A total of six leading companies in the nuclear fuel supply industry will participate in the ENEC fuel supply program. ConverDyn (U.S.); Uranium One, Inc. (Canada); URENCO (headquartered in the U.K.); Rio Tinto (headquartered in the U.K.); TENEX (Russia); AREVA (France).

Contact Us

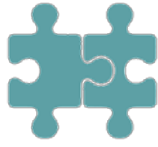
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**Opportunity
Matching**



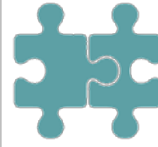
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